136. (New) The transducer of claim 135, wherein said second pole-tip has a length measured in said longitudinal direction, said length being at least five times greater than said width.

137. (New) The transducer of claim 135, wherein said first and second pole-tips are separated by a submicron nonferromagnetic gap layer.

138. (New) The transducer of claim 135, wherein said second pole-tip consists essentially of sputtered material.

139. (New) The transducer of claim 135, wherein said second pole-tip contains material having a B_s higher than that of Permalloy.

140. (New) The transducer of claim 135, wherein said magnetically soft loop includes a magnetically soft yoke layer adjoining said second pole-tip.

141. (New) The transducer of claim 140, wherein said yoke layer extends further in said track-width direction than in said longitudinal direction.

Remarks

I. The Oath or Declaration

The Office Action states:

> The oath or declaration is defective. A new oath or declaration in compliance with 37 C.F.R. § 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602 01 and 602.02. The oath or declaration is defective because non-initialed and/or non-dated alterations have been made to the oath or declaration See 37 C.F.R § 152(c).

Enclosed herewith is a new executed Declaration identifying this application by application number and filing date to replace the Declaration originally submitted, despite the fact that the alteration in the original Declaration was to an inventor's address, and immediately above that address was the inventor's signature and date.

II. The Drawings

The Office Action states:

> The drawings are objected to as failing to comply with 37 C.F.R. §1.84(p)(5) because they include one or more reference signs not mentioned in the description. Note, for instance,"133" (shown in FIG 3, for instance) and "138" (shown in FIG 3, for instance). Appropriate correction is required"

Applicants submit herewith a Marked-Up sheet number one, in which numeral 120 has been replaced with numeral 138. Applicants also submit herewith a Marked-Up sheet number two, in which numeral 133 has been removed. The Examiner is respectfully requested to indicate approval of this amendment to the drawings. Upon approval by the Examiner, new drawings in compliance with § 1.84 including these changes will be filed.

III. The Specification

The Office Action states:

> The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The Title of the application has been amended to read: "SUBMICRON TRACK-WIDTH POLE-TIPS FOR ELECTROMAGNETIC TRANSDUCERS."

The Office Action states:

> The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

On page 6, line 26, the numeral "120" has been replaced with the numeral "138."

On page 12, line 26, the numeral "138" has been added after the words "trailing end."

IV. The Claims

A. New Claims

New claims 82-141 have been added, all of which read on the Elected Species 1, corresponding to FIG. 2 and FIG 3. Because the total number of claims present after this amendment is less than the total number of claims previously paid for, and because the number of independent claims present after this amendment is less than the number of independent claims previously paid for, no additional fee is due. The Examiner's consideration of the new claims is appreciated.

B. 35 U.S.C. §112

The Office Action states:

> Claim 47 is rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
>
> In line 2 of claim 47, it is indefinite as to whether "a moving media" sets forth a single moving medium or a plurality of moving media as "a" is singular while "media" is plural.

Claim 47 has been amended to replace the word "media" with the word "medium."

C. 35 U.S.C. §102

1. Claims 1, 12 and 47 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,337,783 to Santini. The Office Action states:

> With respect to claim 1, Santini teaches a transducer (900) comprising a plurality of solid layers (includes 902 and 906), including a magnetically soft loop (includes 904, 916, and unlabeled element immediately below 902, lines 31-35 in column 3, for instance) substantially encircling an electrically conductive coil section (includes 905) and terminating in first (unlabeled element immediately below 902, lines 31-35 in column 3, for instance) and second (904) magnetically soft layers separated by an amagnetic gap layer (903), the second magnetically soft layer oriented substantially perpendicular to the amagnetic layer (as shown in FIG. 29, for instance). As the claims are directed to a "transducer", per se, the method limitation(s) appearing in line 5 of claim 1 can only be accorded weight to the extent that it/they affect the structure of the completed transducer. Note that "[d]etermination of patentability in

'product-by-process' claims is based on product itself, even though such claims are limited and defined by process [i e ,"vacuum-deposited"], and thus product in such claim is unpatentable if it is the same as, or obvious form, product of prior art, even if prior product was made by a different process", *In re Thorpe, et al.*, 227 USPQ 964 (CAFC 1985). Furthermore, note that a "[p]roduct-by-process claim, although reciting subject matter ofclaim in terms ofhow it is made [i.e.,"vacuum-deposited"], is still product claim; it is patentability of product claimed and not recited process steps that must be established, in spite of fact that claim may recite only process limitations", *In re Hirao and Sato*, 190 USPQ 685 (CCPA 1976).

With respect to claim 12, Santini teaches a transducer (900) comprising a plurality of solid layers (includes 902 and 906), including a magnetically soft loop (includes 904, 916, and unlabeled element immediately below 902, lines 31-35 in column 3, for instance) substantially encircling an electrically conductive coil section (includes 905) and terminating in first (904) and second (unlabeled element immediately below 902, lines 31-35 in column 3, for instance) magnetically soft layers separated by an amagnetic gap layer (903), the first magnetically soft layer oriented substantially perpendicular to the second magnetically soft layer (as shown in FIG 28, for instance) As the claims are directed to a "transducer", per se, the method limitation(s) appearing in line 5 of claim 12 can only be accorded weight to the extent that it/they affect the structure of the completed transducer. Note that "(d]etermination of patentability in 'product-by-process' claims is based on product itself, even though such claims are limited and defined by process (i.e., "sputtered"], and thus product in such claim is unpatentable if it is the same as, or obvious form, product of prior art, even if prior product was made by a different process " See *In re Thorpe, et al.*, supra. Furthermore, note that a "[p]roduct-by-process claim, although reciting subject matter of claim in terms of how it is made (i. e.,"sputtered"], is still product claim; it is patentability of product claimed and not recited process steps that must be established, in spite of fact that claim may recite only process limitations." See *In re Hirao and Sato*, supra.

With respect to claim 47, Santini teaches an information storage system (30) comprising a moving medium (34); a transducer (40/900) disposed adjacent the moving medium and containing a plurality of layers (includes 902 and 906) deposited on a wafer substrate (42), the layers including a magnetically soft loop (includes 904, 916, and unlabeled element immediately below 902, lines 31-35 in column 3, for instance) substantially encircling an electrically conductive coil section (includes 905) and terminating adjacent the medium in a first magnetically soft pole-tip layer (unlabeled element immediately below 902, lines 3 1-35 in column 3, for instance) and a second magnetically soft pole-tip layer (904), with an amagnetic gap layer (903) disposed between the pole-tip layers, wherein a portion of the medium adjacent to the transducer travels

in a direction (as shown in FIG. 1, for instance) and the second magnetically soft layer is oriented substantially parallel to the direction (as shown in FIGS. 28-29 relative to FIGS. 1-3).

Claim 1 has been amended to recite:

"A transducer comprising:

a plurality of solid layers, including a magnetically soft loop substantially encircling an electrically conductive coil section and terminating in leading and trailing magnetically soft layers separated by an amagnetic gap layer, said trailing magnetically soft layer being oriented substantially perpendicular to said amagnetic layer, wherein said trailing magnetically soft layer has a width measured in a direction substantially parallel to said amagnetic layer, said width being less than about four hundred nanometers and greater than about twenty angstroms."

Applicants respectfully assert that Santini does not teach or suggest a "trailing magnetically soft layer" having "a width measured in a direction substantially parallel to said amagnetic layer, said width being less than about four hundred nanometers and greater than about twenty angstroms," in contrast to claim 1.

For at least this reason claim 1 is not anticipated by Santini.

Claim 12 has been amended to recite:

"A transducer for an information storage system, the transducer comprising:

a plurality of solid layers, including a magnetoresistive sensor layer and a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent a media-facing surface in leading and trailing magnetically soft layers separated by an amagnetic gap layer, said trailing magnetically soft layer being oriented substantially perpendicular to said magnetoresistive sensor layer and having a width measured in a direction substantially parallel to said magnetoresistive sensor layer, said width being less than about four hundred nanometers and greater than about twenty angstroms."

Applicants respectfully assert that Santini does not teach or suggest a "trailing magnetically soft layer being oriented substantially perpendicular to said magnetoresistive sensor layer and having a width measured in a direction substantially

parallel to said magnetoresistive sensor layer, said width being less than about four hundred nanometers and greater than about twenty angstroms," in contrast to claim 12.

For at least this reason claim 12 is not anticipated by Santini.

Claim 47 has been amended to recite:

"An information storage system comprising:

a moving medium,

a transducer disposed adjacent said moving medium, said transducer containing a plurality of layers deposited on a wafer substrate, said layers including a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent said medium in a leading magnetically soft pole-tip layer and a trailing magnetically soft pole-tip layer, with an amagnetic layer disposed between said pole-tip layers,

wherein a portion of said medium adjacent to said transducer travels in a longitudinal direction from said leading pole-tip layer to said trailing pole-tip layer, and said trailing pole-tip layer has a width measured substantially perpendicular to said longitudinal direction, said width being less than four hundred nanometers."

Applicants respectfully assert that Santini does not teach or suggest a "trailing pole-tip layer" having "a width measured substantially perpendicular to said longitudinal direction, said width being less than four hundred nanometers," in contrast to claim 47.

For at least this reason claim 47 is not anticipated by Santini.

2. Claim 23 stands rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,890,278 to Van Kesteren. The Office Action states:

> Van Kesteren teaches a transducer comprising a magnetically soft loop (includes 9/109 and 17/117) substantially encircling an electrically conductive coil section (includes 121) and terminating adjacent a media-facing surface (19/119) in first (17/117) and second (9/109) magnetically soft layers separated by an amagnetic gap layer (15/115), wherein the second magnetically soft layer has a growth morphology that is not substantially perpendicular to the amagnetic gap layer (lines 60-67 in column 3, for instance).

Claim 23 has been amended to recite:

"A transducer for an information storage system, the transducer comprising:

a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent a media-facing surface in leading and trailing magnetically soft layers separated in a longitudinal direction by an amagnetic gap layer, said longitudinal direction being perpendicular to a track-width direction, wherein said trailing magnetically soft layer has a growth morphology that is not substantially perpendicular to said track-width direction."

Applicants respectfully assert that Van Kesteren does not teach or suggest a "trailing magnetically soft layer" that "has a growth morphology that is not substantially perpendicular to said track-width direction," in contrast to claim 23.

For at least this reason claim 23 is not anticipated by Van Kesteren.

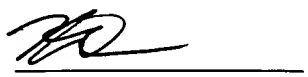
D. Other Cited Art

The other alleged prior art cited in the Office Action has been reviewed. Applicants respectfully assert that all of the pending claims are patentable over all of the art of record.

V. Conclusion

Applicants have responded to each item of the Office Action, and respectfully request reconsideration of the pending claims. Applicants believe that the claims are in condition for allowance, and a Notice of Allowance is solicited.

Respectfully submitted,



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CERTIFICATE OF MAILING

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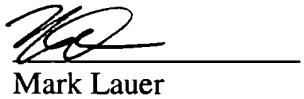
Date: 6-20-02



Mark Lauer

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of Kenneth E. Knapp et al.		Ser. No:	09/500,380
Filing Date:	February 8, 2000	Examiner:	C. Renner
Atty. Docket No:	RR-1645	GAU:	2652

For: SUBMICRON TRACK-WIDTH POLE-TIPS FOR ELECTROMAGNETIC TRANSDUCERS

June 20, 2002

Box No Fee Amendment
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

The following Marked-Up Specification is presented to explain an Amendment that is separately enclosed.

Marked-Up Specification

Please amend the Title of the application to read:

SUBMICRON TRACK-WIDTH POLE-TIPS FOR ELECTROMAGNETIC TRANSDUCERS

The following paragraph is a Marked-Up copy of a replacement for the paragraph beginning on page 6, line 16 of the Specification:

The transducer 102 is formed in a series of layers on a substrate 107, beginning with a first magnetically permeable shield layer 110. For the situation in which the shield is made of Permalloy, the shield may have a thickness of about 2μm and a width that is several times larger than its thickness. A first amagnetic (non-ferromagnetic), electrically insulating read gap layer is formed on the first shield 110 to separate the first shield from a MR sensor 112. A second amagnetic, electrically insulating read gap layer is formed on the MR sensor 112 to separate the MR sensor from

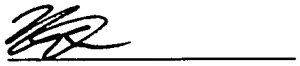
a second shield 115. The read gap layers may have a thickness in a range between about 50Å and 400Å, and may be formed of a variety of materials including Alumina, DLC, SiC and SiO_2. Second shield 115 also serves as a first pole-tip of a magnetically permeable yoke that encircles a conductive coil, not shown in this figure, the first pole-tip 115 being separated from the trailing pole-tip 105 by an amagnetic, electrically insulating recording gap 118, which may have a thickness on the order of 200nm. The trailing pole-tip 105 is encased with an amagnetic, electrically insulating layer defining a trailing end [120] 138 of head 100. In this embodiment of a merged MR and inductive head, reading of signals is performed by the MR sensor 112, while writing of patterns on the media is performed by magnetic flux spreading out from the gap 118 while travelling between the pole-tips 105 and 115. The width W1 of the trailing pole-tip 105 corresponds to a width of a data track recorded on the medium, and may be more or less than the gap 118 between the pole-tips 105 and 115. Although difficult to depict in this figure, the MR sensor 112 may have a width that is less than W1, and a thickness that is even less.

The following paragraph is a Marked-Up copy of a replacement for the paragraph beginning on page 12, line 14 of the Specification:

Referring again to FIG. 3, atop layer 117 and the exposed pole-tip 105 a second magnetically permeable yoke layer 130 is formed by sputtering and/or electroplating. The mask through which the yoke was formed has an edge 132 that overlaps the pole-tip but does not extend as close to the media-facing surface as the pole-tip. In an alternative embodiment, not shown in this figure, the yoke layer 130 extends as close to the media-facing surface as the pole-tip 105, forming a T-shaped pole-tip when viewed from the media-facing surface. A layer 155 of hard, amagnetic, electrically insulating material such as Alumina or DLC is formed over and around the second yoke layer 130, and after planarization of those layers a small portion of layer 155 is disposed between the yoke layer 130 and the overcoat 106. Another layer 135 of hard, amagnetic, electrically insulating material such as Alumina or DLC is formed atop the planarized second yoke layer 130 and surrounding layer 155, protecting the transducer 102 on a trailing end 138 of the head 100. After dicing the wafer into rows each containing multiple transducers

such as transducer 102, the rows are rotated ninety degrees and a protective overcoat 106 is then deposited while forming the media-facing surface 108.

Respectfully submitted,



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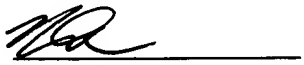


Mark Lauer

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of Kenneth E. Knapp et al.		Ser. No:	09/500,380
Filing Date:	February 8, 2000	Examiner:	C. Renner
Atty. Docket No:	RR-1645	GAU:	2652

For: SUBMICRON TRACK-WIDTH POLE-TIPS FOR ELECTROMAGNETIC TRANSDUCERS

June 20, 2002

Box No Fee Amendment
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

The following Marked-Up Claims are presented to explain an Amendment that is separately enclosed.

Marked-Up Claims

1. (Twice Amended) A transducer comprising:

a plurality of solid layers, including a magnetically soft loop substantially encircling an electrically conductive coil section and terminating in [first and second] leading and trailing magnetically soft layers separated by an amagnetic gap layer, said [second] trailing magnetically soft layer [composed of vacuum-deposited material and] being oriented substantially perpendicular to said amagnetic layer, wherein said trailing magnetically soft layer has a width measured in a direction substantially parallel to said amagnetic layer, said width being less than about four hundred nanometers and greater than about twenty angstroms.

12. (Twice Amended) A transducer for an information storage system, the transducer comprising:

a plurality of solid layers, including a magnetoresistive sensor layer and a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent a media-facing surface in [first and second] leading and trailing [sputtered] magnetically soft layers separated by an amagnetic gap layer, said [first] trailing magnetically soft layer being oriented substantially perpendicular to said [second magnetically soft] magnetoresistive sensor layer and having a width measured in a direction substantially parallel to said magnetoresistive sensor layer, said width being less than about four hundred nanometers and greater than about twenty angstroms.

23. (Twice Amended) A transducer for an information storage system, the transducer comprising:

a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent a media-facing surface in [first and second] leading and trailing magnetically soft layers separated in a longitudinal direction by an amagnetic gap layer, said longitudinal direction being perpendicular to a track-width direction, wherein said [second] trailing magnetically soft layer has a growth morphology that is not substantially perpendicular to said [amagnetic gap layer] track-width direction.

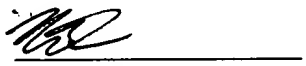
47. (Twice Amended) An information storage system comprising:

a moving [media] medium,

a transducer disposed adjacent said moving [media] medium, said transducer containing a plurality of layers deposited on a wafer substrate, said layers including a magnetically soft loop substantially encircling an electrically conductive coil section and terminating adjacent said [media] medium in a [first] leading magnetically soft pole-tip layer and a [second] trailing magnetically soft pole-tip layer, with an amagnetic layer disposed between said pole-tip layers,

wherein a portion of said [media] medium adjacent to said transducer travels in a longitudinal direction from said leading pole-tip layer to said trailing pole-tip layer, and said [second magnetically soft] trailing pole-tip layer [is oriented] has a width measured substantially [parallel] perpendicular to said longitudinal direction, said width being less than four hundred nanometers.

Respectfully submitted,



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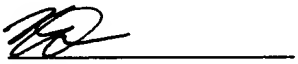

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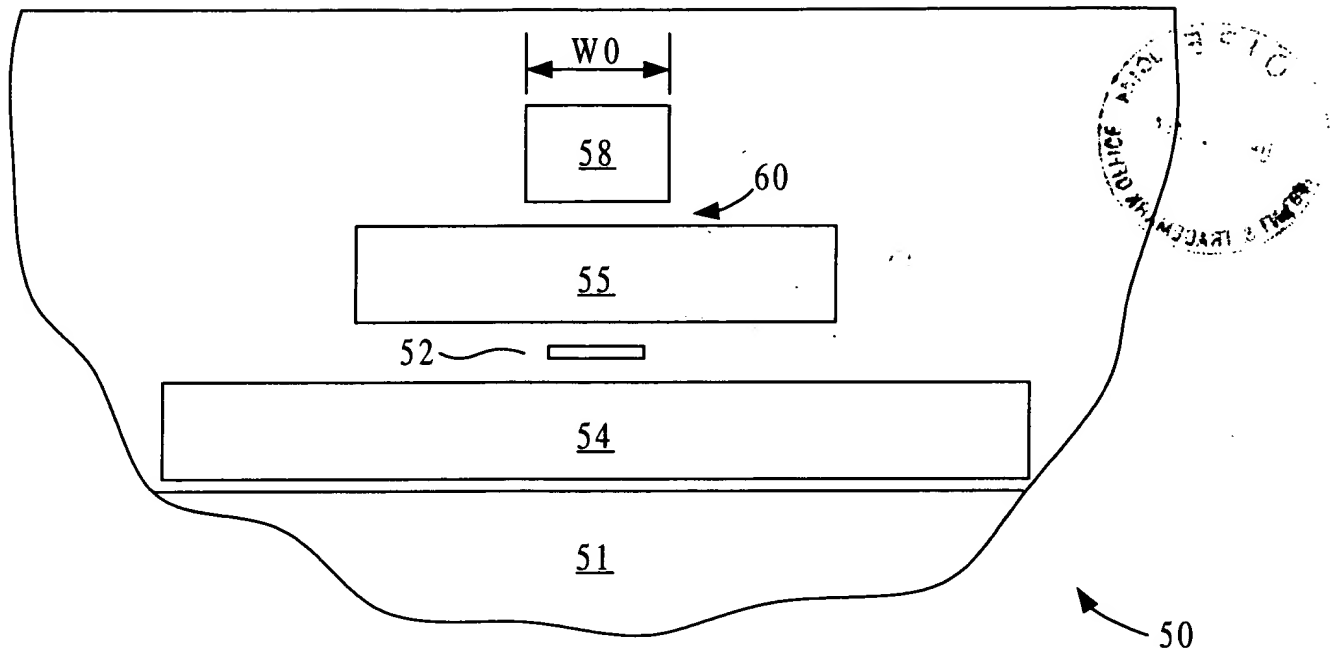

FIG. 1
(Prior Art)

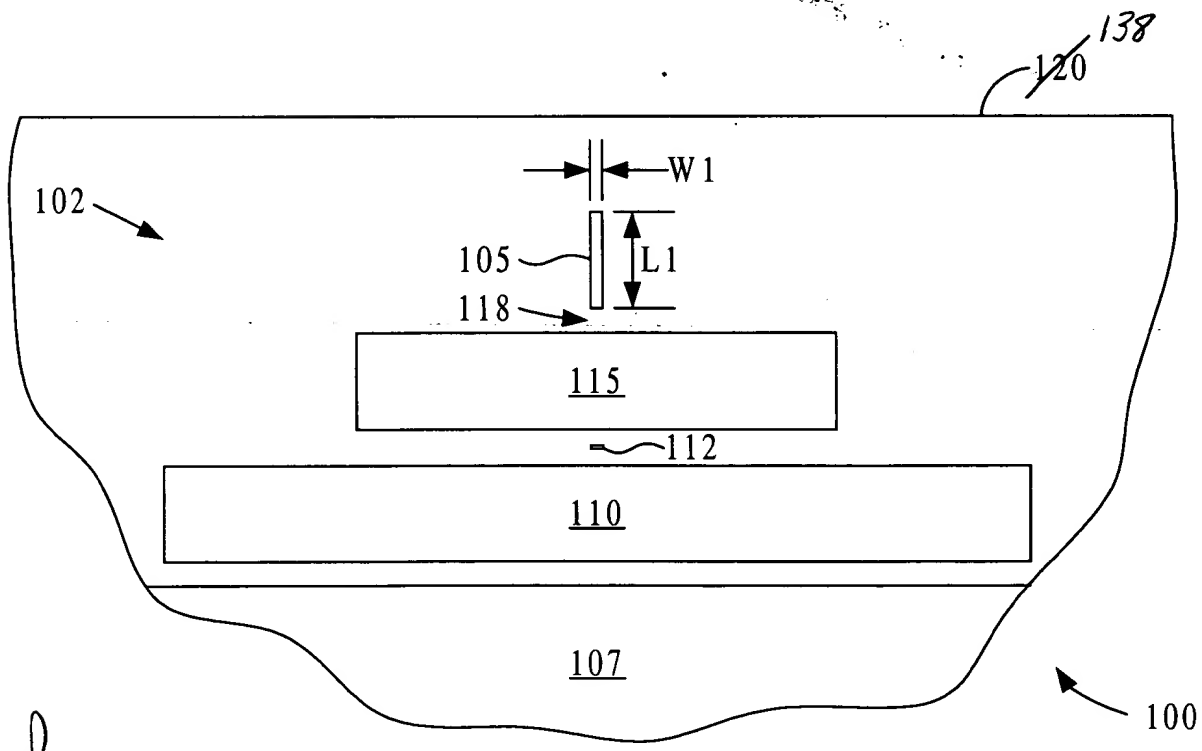

FIG. 2

Approved
CAR/1-10-03

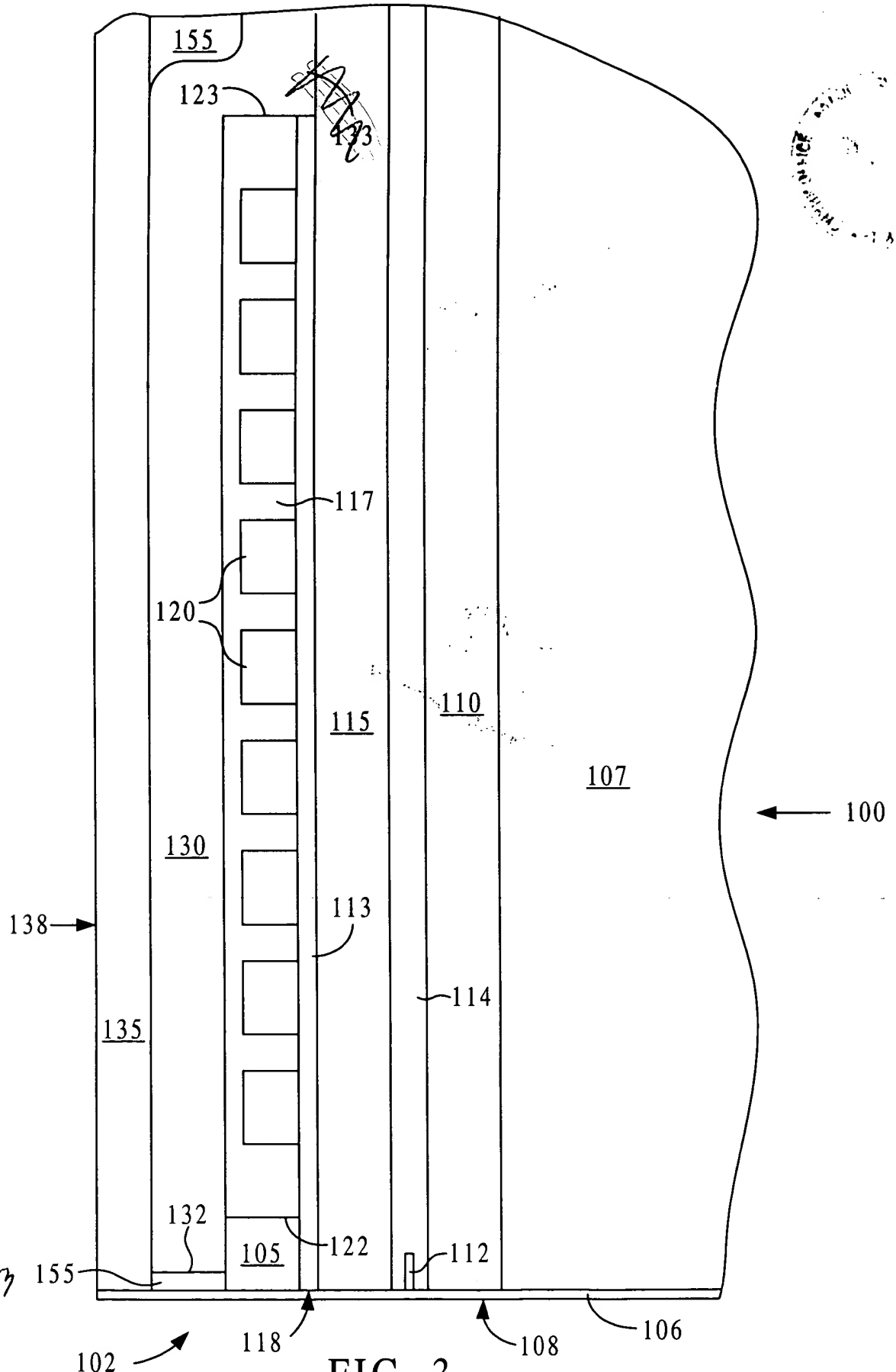
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FIG. 3